

WHAT IS CLAIMED IS:

1. A catalyst combustion system comprising:

a closable first fuel supply line which supplies a fluid containing a first fuel;

5 a closable first oxidizer supply line which supplies a fluid containing a first oxidizer for the first fuel to be combustible therewith under assistance of a catalyst;

a second fuel supply line which supplies a fluid containing a second fuel different from the first fuel;

10 a second oxidizer supply line which supplies a fluid containing a second oxidizer for the second fuel to be combustible therewith under assistance of the catalyst; and

15 a catalyst combustor configured to alternately perform a first catalyst combustion between the first fuel and the first oxidizer and a second catalyst combustion between the second fuel and the second oxidizer, and to supply as a thermal medium a fluid containing one of a combustion product of the first catalyst combustion and a combustion product of the second catalyst combustion, wherein

the catalyst combustor

20 comprises a first catalyst combustion portion connected to the first fuel supply line and the first oxidizer supply line, a second catalyst combustion portion connected to the second fuel supply line and the second oxidizer supply line, and a fluid communication portion connecting the first catalyst combustion portion and the second catalyst combustion portion to each other, and

25 has a fixed relationship provided among a fluid resistance of the first catalyst combustion portion, a fluid resistance of the second catalyst combustion portion, and a fluid resistance of the fluid communication portion, whereby substantially the first catalyst combustion is caused to occur simply in the first catalyst combustion portion, and the second catalyst combustion is caused to occur in the first catalyst combustion portion and the second catalyst combustion portion.

30 2. A catalyst combustion system according to claim 1, wherein the fixed relationship includes that the fluid resistance of the second catalyst combustion portion is greater than the fluid resistance of the first catalyst combustion portion.

35 3. A catalyst combustion system according to claim 2, wherein the fixed relationship includes that the fluid resistance of the second catalyst combustion portion is substantially equal to a sum of the fluid resistance of the first catalyst combustion portion and the fluid resistance of the fluid communication portion.

4. A catalyst combustion system according to claim 1, wherein the first catalyst combustion portion comprises

a first gas chamber connected to the first fuel supply line and the first oxidizer supply line,

a first set of catalyst combustion path parts connected to the first gas chamber,

5 a first substrate formed with the first set of catalyst combustion path parts, and

a heat insulating first accommodation part which accommodates the first substrate,

10 the fluid resistance of the first catalyst combustion portion is representative of a sum of a fluid resistance of the first gas chamber and a fluid resistance of the first set of catalyst combustion path parts,

the second catalyst combustion portion comprises

a second gas chamber connected to the second fuel supply line and the second oxidizer supply line,

15 a second set of catalyst combustion path parts connected to the second gas chamber,

a second substrate formed with the second set of catalyst combustion path parts, and

20 a heat insulating second accommodation part which accommodates the second substrate, and

the fluid resistance of the second catalyst combustion portion is representative of a sum of a fluid resistance of the second gas chamber and a fluid resistance of the second set of catalyst combustion path parts.

5. A catalyst combustion system according to claim 4, wherein

25 the first set of catalyst combustion path parts comprises

a first set of combustion paths communicating with the first gas chamber, and

a first set of films of the catalyst configured to define the first set of combustion paths,

30 the fluid resistance of the first set of catalyst combustion path parts is representative of a fluid resistance of the first set of combustion paths,

the second set of catalyst combustion path parts comprises

a second set of combustion paths communicating with the second gas chamber, and

35 a second set of films of the catalyst configured to define the second set of combustion paths, and

the fluid resistance of the second set of catalyst combustion path parts is representative of a fluid resistance of the second set of combustion paths.

6. A catalyst combustion system according to claim 5, wherein

the first set of combustion paths comprises a first plurality of straight fluid paths provided through the first substrate,

the second set of combustion paths comprises a second plurality of straight fluid paths provided through the second substrate, the second plurality being greater than the first plurality, and

the first plurality of straight fluid paths has a greater average sectional area than the second plurality of straight fluid paths.

7. A catalyst combustion system according to claim 5, wherein the first set of combustion paths includes a combustion path having a greater sectional area at an upstream end thereof than at a downstream end thereof.

8. A catalyst combustion system according to claim 4, wherein

the fluid communication portion comprises a separation wall configured to separate the first gas chamber from the second gas chamber, and

a set of through holes formed in the separation wall, and

the fluid resistance of the fluid communication portion is representative of a fluid resistance of the set of through holes.

9. A catalyst combustion system according to claim 1, wherein the first catalyst combustion portion has a smaller heat capacity than the second catalyst combustion portion.

10. A catalyst combustion system according to claim 9, wherein the catalyst combustor has a heat insulating layer interposed between the first catalyst combustion portion and the second catalyst combustion portion.

11. A catalyst combustion system according to claim 1, wherein the first catalyst combustion portion is enclosed by the second catalyst combustion portion.

12. A catalyst combustion system according to claim 1, wherein the catalyst combustor has a substantially cylindrical enclosure circumscribed about the first catalyst combustion portion and the second catalyst combustion portion.

13. A fuel reforming system including a fuel reformer configured to reform a fuel using the heat medium of a catalyst combustion system according to claim 1.

14. A fuel reforming system according to claim 13, wherein the second fuel contains the fuel reformed by the fuel reformer.

15. A fuel cell system including a fuel cell having a fuel electrode configured to

consume the reformed fuel of a fuel reforming system according to claim 13.

16. A fuel cell system according to claim 15, wherein the second fuel contains an effluent gas of the fuel electrode of the fuel cell, and the second oxidizer contains an effluent gas of an air electrode of the fuel cell.

5